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RESEARCH ARTICLE

Islamic banking, credit, and economic growth: Some empirical evidence

Guglielmo Maria Caporale^{1,2,3}  | Mohamad Husam Helmi⁴

¹ Department of Economics and Finance,
Brunel University London, London, UK

² CESifo, Munich, Germany

³ DIW, Berlin, Germany

⁴ Department of Economics and Finance,
Durham University Business School,
Durham, UK

Correspondence

Guglielmo Maria Caporale, Department of
Economics and Finance, Brunel
University London, London UB8 3PH,
UK.

Email: guglielmo-maria.caporale@brunel.ac.uk

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Abstract

This paper examines the effects of Islamic banking on the causal linkages between credit and gross domestic product (GDP) by comparing two sets of seven emerging countries, the first without Islamic banks and the second with a dual banking system including both Islamic and conventional banks. Unlike previous studies, it checks the robustness of the results by applying both time series and panel methods; moreover, it tests for both long- and short-run causality. In brief, the findings highlight significant differences between the two sets of countries reflecting the distinctive features of Islamic banks. Specifically, the time series analysis provides evidence of long-run causality running from credit to GDP in countries with Islamic banks. This is confirmed by the panel causality tests, although in this case short-run causality in countries without Islamic banks is also found.

KEYWORDS

causality tests, credit, growth, Islamic banking

1 | INTRODUCTION

The finance–growth nexus has been extensively investigated in the literature, with mixed evidence: Some studies reach the conclusion that financial development boosts economic growth (e.g., Beck, Degryse, & Kneer, 2014; King & Levine, 1993; McKinnon, 1973; Schumpeter, 1911; Shaw, 1973), whereas others argue that causality runs in the opposite direction (e.g., Ang & McKibbin, 2007; Berthelemy & Varoudakis, 1996; Robinson, 1953); Rousseau and Wachtel (2011) have reported that the linkage has become weaker over time. Moreover, there is no consensus on how to measure financial development and how to handle the endogeneity problem. Most recently, the Bank for International Settlements (BIS) has focused on the role of credit and whether it might

be used as an early warning indicator, because excessive lending is thought to be one of the main factors that have caused the global financial crisis of 2007–2008. The credit-to-gross domestic product (GDP) ratio was in fact adopted by the Basel III committee (2010) as a guide to build up countercyclical capital buffers during booms in order to use them during crises (see Drehmann, 2013).

An interesting issue not thoroughly analysed in the literature is whether the relationship between credit and economic growth is different in countries with Islamic banks. Such institutions are not allowed to charge a predetermined interest rate, which is replaced by the ex post profit and loss sharing (PLS) rate (Chong & Liu, 2009). Further, they can only provide credit for transactions related to a tangible, underlying asset and cannot engage in any speculative activities (Hasan &

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Dridi, 2010; Kammer et al., 2015; Khan, 2010). Only a few empirical studies of countries with Islamic banking exist. Majid and Kassim (2010) find evidence supporting the “supply-leading” view. By contrast, Furqani and Mulyany (2009) report that economic growth causes financial development only in the short run in a country with Islamic banking such as Malaysia—on the whole, their analysis is consistent with the “demand-following” view. Abduh and Omar (2012) find bidirectional causality between Islamic finance and economic growth in Indonesia. Most recently, Imam and Kpodar (2016) conclude that countries with Islamic banks experience faster economic growth than those without Islamic banks.

The present paper aims to examine in depth the effects of Islamic banking on the causal linkages between credit and GDP by comparing two sets of seven emerging countries, the first without Islamic banks and the second with a dual banking system including both Islamic and conventional banks. Unlike previous studies, it checks the robustness of the results by applying both time series and panel methods. Moreover, it tests for both long- and short-run causality; the former has been analysed in the traditional literature on the finance–growth nexus, whereas the latter is relevant for the current debate on macroprudential policies and the attempt by the BIS to identify the best early warning indicators. Our analysis also seeks to contribute to the ongoing debate on whether the PLS paradigm of Islamic banking might lead to an optimal distribution of funds (Siddiqi, 1999) and on the role of Islamic finance in promoting economic growth rather than causing an increase in the price level by linking all financial transaction to real economic activities (Chapra, 1992; Gulzar & Masih, 2015; Kammer et al., 2015; Mills & Presley, 1999).

In brief, our findings highlight significant differences between the two sets of countries. Specifically, the time series analysis provides evidence of long-run causality running from credit to GDP in countries with Islamic banks. This is confirmed by the panel causality tests, although in this case short-run causality in countries without Islamic banks is also found. The layout of the paper is as follows: Section 2 briefly reviews the principles of Islamic banking; Section 3 describes the data; Section 4 outlines the methodology; Section 5 discusses the empirical results; and finally, Section 6 offers some concluding remarks.

2 | ISLAMIC BANKING

The principles of Islamic finance are based on the Quran, hadith,¹ and Islamic jurisprudence (Sharia). The first is the prohibition of interest payment (Riba), defined by some Islamic scholars as usury and by others as any predetermined interest rate (Chong & Liu, 2009). In the

Holy Quran, 10 statements/verses condemned the practice of Riba or charging predetermined interest rate. For example, the Surah/chapter al-Baqarah says: “O you who believe! Fear God and give up whatever remains of Riba (usury), if you are believers” (Quran 2:278). Another verse in the Surah al-Baqarah distinguishes between Riba and trading: “Allah has allowed trading and forbidden Riba (usury)” (Quran 2:275). Further, Ebrahim, Molyneux, and Ongena (2017) defined usury as an injunction to protect property rights. Therefore, many financial contracts are constructed on the basis of the difference between trading and Riba as well as Islamic jurisprudence (Sharia), for instance, Musharaka (partnership), Mudharabah (profit sharing), Murabahah (cost plus), and Ijarah (leasing) contracts.² Thus, Islamic financial institutions are not allowed to make money through pure financing, and financial contracts must be linked directly to real economic activities (Gulzar & Masih, 2015; Kammer et al., 2015). Each financial transaction is underpinned by an existing or potential real asset, in contrast to the case of conventional banks that can provide credit without such constraints (see Askari, 2012; Siddiqi, 2006).

The second principle is based on the PLS paradigm between the two parties of any financial contract, which is seen as a crucial feature that distinguishes Islamic from conventional banks. Furthermore, the conventional *ex ante* interest rate, which is a risk-shifting rate, is replaced by the *ex post* PLS rate, which is instead a risk-sharing rate (Chong & Liu, 2009). This is thought to encourage Islamic banks to invest in small and medium enterprises and long-term ventures and thus to stimulate economic growth (Chapra, 1992; Mills & Presley, 1999). Solarin, Hammoudeh, and Shahbaz (2018) argue that banks and borrowers are involved in venture financing even though Islamic financial transactions are expected to be based on PLS. The prohibition of the conventional *ex ante* interest rate is viewed as a foundation for improvements in both social justice and economic efficiency (Berg & Kim, 2014; El-Gamal, 2006).

The third principle does not allow Islamic banks to engage in any speculative transactions, option and futures contracts, hedging, toxic assets, gambling, and funding of any activities, which are considered harmful to the community such as producing alcohol (Hasan & Dridi, 2010; Kammer et al., 2015; Khan, 2010). It is thought that financing such activities would cause an increase in prices rather than contributing to GDP. The fourth principle requires asset backing: Transactions should be related to a tangible, underlying asset. In addition, the main criterion for the allocation of credit by Islamic banks is the productivity of the project, instead of the creditworthiness of the customer as in the case of conventional banks. Therefore, credit is channelled to productive investment rather than

speculative activities, which are not allowed according to the principles of Islamic finance (Di Mauro et al., 2013). Bernanke (2009) and Turner (2009) argue that excessive and unproductive credit growth, investment in speculative transactions, and interest-based debt financing were in fact some of the main causes of the 2007–2008 financial crisis. In contrast, in the Islamic banking system, these activities are either not allowed or partly mitigated—for instance, as highlighted by Mohieldin (2012), asset-backed debt guarantees a direct relationship between loans and the real economy. In this way, greater market discipline and financial stability are achieved (Di Mauro et al., 2013). Given the distinctive features of Islamic banking, one would expect to find differences in the role of credit between countries with and without Islamic banks. This is the issue analysed in this study.

3 | DATA DESCRIPTION

We investigate the causal relationship between real credit to the private sector and real GDP in 14 emerging countries with sufficiently long time series. These are divided into two groups (see Table 1): The first includes countries without Islamic banks, specifically Latin American countries with a similar level of development to those with Islamic banks and without recent long periods of colonial history affecting their institutions (viz., Argentina, Brazil, Chile, Costa Rica, Ecuador, Guatemala, and Peru); the second includes countries with both Islamic and conventional banks according to the Bankscope database (Malaysia, Indonesia, Turkey, Iran, Jordan, Singapore, and Tunisia). Oil-exporting countries with Islamic banks are excluded from the sample because their economic growth might be mainly driven by oil revenues rather than financial development or credit. However, Iran has been included because its economy has many other industrial sectors and does not depend solely on oil revenues.

The data source is the International Monetary Fund database. The (seasonally adjusted) series are credit to the private sector (Cr), GDP, and the consumer prices index (CPI). These have been logged, and real credit (RCR) and GDP (RGDP) series have been created using the price deflator. The model we estimate to analyse the causal linkages between real credit and real GDP also includes the following variables: the real exchange rate (REX_t), the inflation rate (INF_t), and the real interest rate (I_t). The real exchange rate (EX_t) is added as an international variable that might potentially influence GDP. The real interest rate affects consumption and investment decision, which have an impact on demand for credit from banks as well as economic growth (Kassim, 2016). The inflation rate is a measure of price stability that can have effects on both the financial sector and the real economy. The choice of these additional variables is in line with existing empirical studies such as Gheeraert (2014), Kassim (2016), Abedifar, Hasan, and Tarazi (2016), and Imam and Kpodar (2016).

Following the International Monetary Fund definition of credit,³ we calculated credit as gross credit injected into all private sectors of the economy, that is, excluding credit to the government. This is because credit to the private sector increases in boom periods and decreases during credit crunches or crises, whereas credit to the public sector moves in the opposite direction (see Drehmann, Borio, & Tsatsaronis, 2011).

The credit to GDP ratio in countries without Islamic banks was around 20–30% in 2001 in most of these countries. It then increased reaching around 60% in Brazil and Costa Rica in 2016. However, it is much higher in Chile, where it increased from 64.48% in 2001 to 80.76% in 2016 (see Figure 1). On the other hand, most countries with Islamic banks have a higher credit to GDP ratio, which was above 60% in 2001 except for Indonesia and Turkey, where it reached 66.20% in 2016 (see Figure 2). Singapore and Malaysia experienced a decrease in this ratio between 2001 and 2007–2008, and then it increased to around

TABLE 1 Sample of countries

Data set 1: Seven countries without Islamic banks		Data set 2: Seven countries with Islamic banks	
	Period		Period
Argentina	1993Q1–2016Q4	Indonesia	2001Q4–2016Q4
Brazil	2001Q4–2016Q4	Turkey	2001Q4–2016Q4
Chile	1997Q4–2016Q4	Iran	1994Q1–2007Q4 ^a
Costa Rica	2001Q4–2016Q4	Singapore	2003Q1–2016Q4
Ecuador	2001Q4–2016Q4	Jordan	1992Q1–2016Q4
Guatemala	2001Q4–2016Q4	Tunisia	2000Q1–2015Q3
Peru	1996Q1–2016Q4	Malaysia	2001Q4–2016Q4

^aData are not available for Iran beyond 2007.

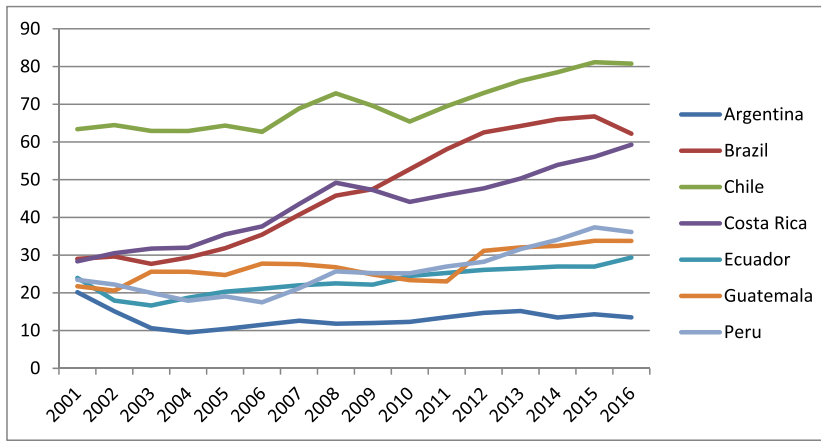


FIGURE 1 Credit to gross domestic product ratio in countries without Islamic banks [Colour figure can be viewed at wileyonlinelibrary.com]

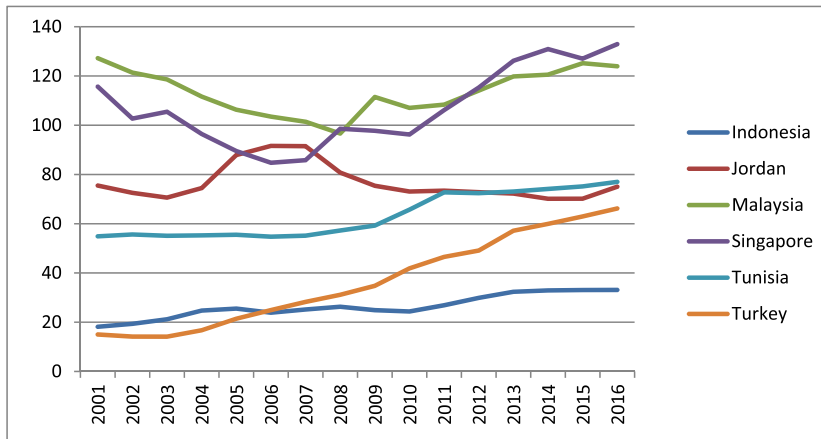


FIGURE 2 Credit to gross domestic product ratio in countries with Islamic banks [Colour figure can be viewed at wileyonlinelibrary.com]

125% in 2016. Overall, the credit to GDP ratio appears to be higher in countries with Islamic banks in comparison with those with only conventional banks.

4 | METHODOLOGY

The statistical approach taken in this study involves three steps. First, the order of integration of the variables is determined by means of unit root tests. Second, the existence of long-run equilibrium relationships is tested using cointegration techniques as in Johansen (1988, 1995). Third, Granger causality tests are carried out on the basis of the findings from the cointegration analysis—in the context of a vector autoregression or a vector error correction model (VECM), respectively, depending on whether cointegration does not or does hold. In the former case, the model is the following:

$$\begin{aligned} \Delta RGDP_t = & \alpha_1 + \sum_{i=1}^k \beta_{1i} \Delta RGDP_{t-i} + \sum_{i=1}^k \varphi_{1i} \Delta RCR_{t-i} \\ & + \sum_{i=1}^k \partial_{1i} \Delta EX_{t-i} + \sum_{i=1}^k \gamma_{1i} \Delta INF_{t-i} \\ & + \sum_{i=1}^k \delta_{1i} \Delta I_{t-i} + \epsilon_{1t}, \end{aligned} \quad (1)$$

$$\begin{aligned} \Delta RCR_t = & \alpha_2 + \sum_{i=1}^k \varphi_{2i} \Delta RCR_{t-i} + \sum_{i=1}^k \beta_{2i} \Delta RGDP_{t-i} \\ & + \sum_{i=1}^k \partial_{2i} \Delta EX_{t-i} + \sum_{i=1}^k \gamma_{2i} \Delta INF_{t-i} \\ & + \sum_{i=1}^k \delta_{2i} \Delta I_{t-i} + \epsilon_{2t}, \end{aligned} \quad (2)$$

where $RGDP_t$ is the log of real GDP whereas RCR_t stands for the log of real credit to the private sector, EX_t is the real exchange rate, INF_t is the inflation rate, I_t is the real interest rate, Δ is the first difference operator, α_1 and α_2 are constant drifts, β_{ji} , φ_{ji} , ∂_{ji} , γ_{ji} , and δ_{ji} are polynomials of order $k - 1$, and ϵ_{1t} and ϵ_{2t} are the residuals. Failure to reject the null hypothesis of $H_0: \sum_{i=1}^k \varphi_{1i} = 0$ implies that real credit to the private sector does not Granger-cause real GDP. Similarly, failure to reject the null hypothesis of $H_0: \sum_{i=1}^k \beta_{2i} = 0$ implies that real GDP does not Granger-cause real credit to the private sector.

Following Engle and Granger (1987), if the order of integration of the series is $I(1)$ and they are cointegrated, an error correction term (ECT) is introduced into the model. Therefore, a VECM is specified as follows:

$$\begin{aligned} \Delta RGDP_t = & \alpha_1 + \sum_{i=1}^k \beta_{1i} \Delta RGDP_{t-i} + \sum_{i=1}^k \varphi_{1i} \Delta RCR_{t-i} \\ & + \sum_{i=1}^k \partial_{1i} \Delta EX_{t-i} + \sum_{i=1}^k \gamma_{1i} \Delta INF_{t-i} + \sum_{i=1}^k \delta_{1i} \Delta I_{t-i} \\ & + \theta_1 ECT_{t-1} + \epsilon_{1t}, \end{aligned} \quad (3)$$

$$\begin{aligned} \Delta RCR_t = & \alpha_2 + \sum_{i=1}^k \varphi_{2i} \Delta RCR_{t-i} + \sum_{i=1}^k \beta_{2i} \Delta RGDP_{t-i} \\ & + \sum_{i=1}^k \partial_{2i} \Delta EX_{t-i} + \sum_{i=1}^k \gamma_{2i} \Delta INF_{t-i} + \sum_{i=1}^k \delta_{2i} \Delta I_{t-i} \\ & + \theta_2 ECT_{t-1} + \epsilon_{2t}, \end{aligned} \quad (4)$$

where α_1 and α_2 are constant drifts, ECT_{t-1} is the error correction term, which represents the deviations from the long-run cointegration relationship, and θ_1 and θ_2 denote the speeds of adjustment towards the long-run equilibrium, which are expected to be negative.

Therefore, there are two sources of causality between the two variables of interest $RGDP_t$ and RCR_t , either through the error correction term (ECT_{t-1}) or through the lagged dynamic terms ΔRCR_{t-i} in Equation (3) or $\Delta RGDP_{t-i}$ in Equation (4). Consequently, one can test for three types of causality between real GDP and real credit to the private sector. First, one can test whether ΔRCR_t Granger-causes $\Delta RGDP_t$ in the short run by carrying out a Wald test of the null hypothesis $H_0: \sum_{i=1}^k \varphi_{1i} = 0$.

Second, one can test for long-run causality by performing a weak exogeneity test on the coefficient of the lagged error correction term ECT_{t-1} . Failure to reject the null hypothesis $H_0: \theta_1 = 0$ implies that real credit to the private sector does not Granger-cause real GDP in the long run. Third, strong exogeneity can be tested by testing the joint significance of the coefficients on the lagged dynamic terms and the lagged error correction term (Engle, Hendry & Richard, 1983; Charemza & Deadman, 1992). The null hypothesis in this case is

$H_0: \sum_{i=1}^k \varphi_{1i} = \theta_1 = 0$. However, this test does not allow to distinguish between long- and short-run causality (Ang & McKibbin, 2007).⁴

Time series techniques have been criticized because small sample distortions can affect the power of standard unit root and cointegration tests (see Christopoulos & Tsionas, 2004). These issues can be addressed using panel approaches (Ang, 2008) to carry out cointegration tests with higher power (Persyn & Westerlund, 2008). Hsiao, Mountain, and Ho-Ilman (1995) argue that the panel approach yields more accurate inference. Further, this

approach provided information on individual units and intertemporal dynamics, which might help in controlling the impact of unobserved or missing variables (Hsiao, 2007). The possible issue of collinearity between the current and lag variables (which is highly possible in time series) can be alleviated because of the interindividual differences (Griliches, 1967; Pakes & Griliches, 1984). With this in mind, we also apply various panel methods to check the robustness of our findings (see below).

5 | EMPIRICAL ANALYSIS

5.1 | Unit root tests

As a first step, we carry out a battery of unit root tests to examine the stochastic properties of the individual series using augmented Dickey–Fuller (Dickey & Fuller, 1981) and Phillips–Perron tests (Phillips & Perron, 1988). These tests suggest that our variables are nonstationary $I(1)$ in the countries with and without Islamic banks. We also applied panel unit root tests, namely, the MW (Maddala & Wu, 1999) and Im–Pesaran–Shin tests (Im, Pesaran, & Shin, 2003),⁵ which confirm that the variables can be characterized as $I(1)$.⁶

5.2 | Cointegration tests

Next, we test for the existence of a long-run relationship between real credit to the private sector and real GDP. For this purpose, we use both time series (Johansen, 1988, 1995) and panel cointegration (Westerlund, 2007) methods.⁷ Because the multivariate tests of Johansen (1988, 1995) are very sensitive to the lag length (see Banerjee, Dolado, Galbraith, & Hendry, 1993; Chang & Caudill, 2005; Cheung & Lai, 1993), we use the Schwarz information criterion to determine the optimal lag length but include extra lags when required to remove serial correlation (as in Hunter & Menla Ali, 2014, where the Akaike information criterion is used instead). We run diagnostic tests for the residuals with the Breusch–Godfrey serial correlation LM test providing no evidence of any remaining serial correlation. Further, the null hypothesis of both homoscedasticity and normality cannot be rejected in any cases. Thus, we conclude that the vector autoregression models are data congruent and carry out the Johansen cointegration tests using the chosen optimal lag length.⁸ Furthermore, to achieve normality in the presence of some outliers in the data, the following dummies were included to remove the effect of extreme observations: Chile 2008Q1, Argentina 2002Q3, Guatemala 2005Q4, Tunisia 2011Q1, Jordan 2008Q1, and Singapore 2008Q4. These outliers mainly correspond to the recent 2007/2008 financial crisis, the

2001 dot-com bubble crisis in the United States, and the start of the Arab spring in Tunisia in January 2011. Juselius (2007) pointed out that ignoring the issue of outliers in the data would produce unreliable results. We follow Dimitraki and Menla Ali (2015) and control for outliers defined as such when the residual is greater than $|3.5\sigma|$.⁹

On the basis of the trace and eigenvalues statistics, the null of no cointegration is rejected at the 1% and 5% levels in the countries without Islamic banks (see Table 2, Panel A), as well as those with Islamic banks (see Table 2, Panel B); therefore, it appears that there is a stable long-run relationship between credit and GDP in every case.¹⁰

Next, we carry out panel cointegration tests, specifically an error correction-based panel cointegration test (Westerlund, 2007). Westerlund (2007) criticizes the panel residual-based tests (e.g., Kao, 1999; Pedroni, 2004), pointing out in particular that the common factor restriction might be invalid, and proposes four more advanced panel cointegration tests with higher power. The first two, G_τ and G_α , are based on group-mean test statistics, which test the alternative hypothesis that the panel as a whole is cointegrated, whereas the other two, p_τ and p_α , are pooled test statistics, which are designed to test the

alternative that at least one of the individual cross-sectional units is cointegrated (Persyn & Westerlund, 2008). The results for these tests are reported in Table 3. It can be seen that both group-mean statistics reject the null hypothesis of no cointegration in all three panels (comprising countries with and without Islamic banks and all countries in turn), suggesting the existence of a long-run relationship between real credit to the private sector and real GDP in each case. However, the other two panel statistics fail to reject the null hypothesis of no cointegration between the two variables.

5.3 | Causality tests

Next, we apply both time series and panel approaches to test for three types of causality (where the null hypothesis is that of no causality): short-run causality, using lags of the explanatory variables; long-run causality (weak exogeneity), using the error correction term; and strong exogeneity, using both lags and the error correction term. As already mentioned, we estimate a VECM given the previous test results suggesting that cointegration holds between real credit to the private sector and real GDP.

TABLE 2 Results of the Johansen cointegration tests

	Null hypothesis: $r = 0$; alternative null: $r = 1$						
	Maximum eigenvalue test			Trace test			
	Max-Eigen statistic (λ_{\max})	95% critical value	p value	Trace statistic (λ_{trace})	95% critical value	p value	K
Panel A. Countries without Islamic banks							
Argentina	20.301	19.387	0.036**	28.015	25.872	0.027**	6
Brazil	38.677	15.892	0.000***	51.751	20.261	0.000***	5
Chile	24.006	19.387	0.001***	29.344	25.872	0.000***	3
Costa Rica	31.778	15.892	0.000***	37.953	20.261	0.018**	3
Ecuador	51.687	15.892	0.000***	55.901	20.261	0.000***	6
Guatemala	21.428	19.387	0.024**	32.450	25.872	0.006***	6
Peru	22.330	19.387	0.018**	31.474	25.872	0.009***	3
Panel B. Countries with Islamic banks							
Indonesia	19.768	15.892	0.011**	24.024	20.261	0.015**	5
Turkey	25.734	15.892	0.001***	34.426	20.261	0.000***	5
Iran	21.888	14.264	0.003***	21.913	15.494	0.005***	6
Singapore	26.653	19.387	0.004***	29.468	25.872	0.017**	3
Jordan	15.937	14.264	0.027**	19.701	15.494	0.011**	4
Tunisia	19.742	19.387	0.044**	27.771	25.872	0.029**	3
Malaysia	17.221	14.264	0.016**	18.425	15.494	0.017**	5

Note. The table reports the Max-Eigen statistics and Johansen trace statistics (Johansen, 1995). r is the number of cointegration vectors. K is the number of lag lengths based on Schwarz information criterion, subject to the removal of serial correlation. Our model includes RCR (real credit to the private sector), RGDP (real GDP), and three exogenous variables (EX is the real exchange rate, INF is the inflation rate, and I is the real interest rate).

Statistical significance at the 5% level. *Statistical significance at the 1% level.

TABLE 3 Results of the Westerlund (2007) panel cointegration test

Test	Panel A. Countries without Islamic banks			Panel B. Countries with Islamic banks			Panel C. All countries		
	Value	z value	p value	Value	z value	p value	Value	z value	p value
G_τ	−4.748	−7.880	0.000***	−4.563	−7.272	0.000***	−4.656	−10.714	0.000***
G_α	−21.55	−3.840	0.000***	−22.10	−4.058	0.000***	−23.59	−6.580	0.000***
p_τ	−5.128	0.538	0.705	−4.322	1.477	0.930	−6.820	1.264	0.897
p_α	−7.218	0.769	0.779	−7.115	0.815	0.792	−8.285	0.419	0.662

Note. The lag length and the leads are selected according to the Akaike information criterion. p values are one-sided test based on the normal distribution. τ and α refer to different test statistics. p_τ and p_α are pooled test statistics; G_τ and G_α are group-mean test statistics. For further information about both pooled and group-mean test statistics, refer to Persyn and Westerlund (2008). Our model includes RCR (real credit to the private sector), RGDP (real GDP), and three exogenous variables (EX is the real exchange rate, INF is the inflation rate, and I is the real interest rate).

***Statistical significance at the 1% level.

TABLE 4 Error correction model (ECM) test with Johansen cointegrating vectors for countries without Islamic banks

Panel A: $H_0 : \Delta RCR \nleftrightarrow \Delta GDP$								
Country	K	SR Granger noncausality test ($H_0 : \text{all } \varphi_{1i} = 0$)		LR weak exogeneity test ($H_0 : \theta_1 = 0$)			SR + LR strong exogeneity test ($H_0 : \text{all } \varphi_{1i} = \theta_1 = 0$)	
		F stat ^a	p values	ECT_{t-1}	t stat ^c	p values	F stat ^b	p values
Argentina	6	3.107	0.011**	0.056	2.737	0.008***	3.288	0.006***
Brazil	5	3.322	0.045**	−0.353	−2.278	0.027**	5.000	0.004***
Chile	3	1.0498	0.356	−0.083	−2.610	0.011**	2.315	0.085*
Costa Rica	3	4.712	0.007***	−0.187	−2.942	0.005***	4.418	0.005***
Ecuador	6	2.968	0.047**	−0.629	−2.898	0.013**	4.264	0.012**
Guatemala	6	2.410	0.064*	−0.176	−0.906	0.373	2.075	0.092*
Peru	3	0.709	0.588	−0.021	−1.346	0.183	4.572	0.001***
Panel B: $H_0 : \Delta GDP \nleftrightarrow \Delta RCR$								
Country	K	SR Granger noncausality test ($H_0 : \text{all } \varphi_{2i} = 0$)		LR weak exogeneity test ($H_0 : \theta_2 = 0$)			SR + LR strong exogeneity test ($H_0 : \text{all } \varphi_{2i} = \theta_2 = 0$)	
		F stat	p values	ECT_{t-1}	t stat	p values	F stat	p values
Argentina	6	1.007	0.4308	−0.047	−2.432	0.018**	1.326	0.257
Brazil	5	1.394	0.258	−0.038	−3.989	0.000***	5.884	0.000***
Chile	3	1.246	0.295	−0.011	−1.076	0.286	0.993	0.402
Costa Rica	3	4.564	0.008***	−0.120	−3.394	0.001***	4.064	0.007***
Ecuador	7	7.927	0.001***	−0.127	−4.293	0.001***	7.360	0.001***
Peru	5	0.050	0.995	−0.088	−2.366	0.021**	1.314	0.272
Guatemala	5	2.780	0.039**	−0.146	−2.278	0.031**	2.434	0.054*

Note. K is number of lags in ECM. In Panel A, F stat^a is of the Wald statistics test for the significance of the null hypothesis $H_0 : \text{all } \varphi_{1i} = 0$, F stat^b is of the Wald statistics test for the significance of the null hypothesis $H_0 : \text{all } \varphi_{1i} = \theta_1 = 0$, and t stat^c is of the Wald statistics test for the significance of the null hypothesis $H_0 : \theta_1 = 0$. Panels A and B are estimated using Equations (3) and (4), respectively. SR is short run and LR is long run.

*Statistical significance at the 10% level. **Statistical significance at the 5% level. ***Statistical significance at the 1% level.

We test for causality within a VECM framework for the countries where cointegration holds according to the Johansen tests. The results are reported in Tables 4 and 5 (t statistic and F statistics), respectively. Our analysis focuses mainly on the causal relationship between

the two variables of interest in this paper, namely, real credit and real GDP. Real credit to the private sector causes real GDP in the short run in Argentina, Brazil, Ecuador, and Costa Rica at the 1% and 5% levels and at the 10% level in Guatemala. Bidirectional short-run

TABLE 5 Error correction model (ECM) test with Johansen cointegrating vectors for countries with Islamic banks

Panel A: $H_0 : \Delta RCR \nrightarrow \Delta GDP$								
Country	K	SR Granger noncausality test ($H_0 : \text{all } \varphi_{1i} = 0$)		LR weak exogeneity test ($H_0 : \theta_1 = 0$)			SR + LR strong exogeneity test ($H_0 : \text{all } \varphi_{1i} = \theta_1 = 0 = 0$)	
		F stat^a	p values	ECT_{t-1}	t stat	p values	F stat^b	p values
Indonesia	5	2.949	0.032**	-0.072	-2.807	0.009***	5.315	0.001***
Turkey	5	2.888	0.035**	-0.461	-3.174	0.004***	3.040	0.023**
Iran	6	2.953	0.024**	-0.460	-2.573	0.016**	6.472	0.000***
Singapore	3	0.605	0.616	-0.039	-2.444	0.020**	1.976	0.122***
Jordan	4	5.307	0.000***	-0.087	-2.023	0.047**	4.633	0.001***
Malaysia	5	0.213	0.808	-0.054	-3.507	0.000***	6.268	0.001***
Tunisia	3	5.829	0.002***	-0.024	-2.245	0.030**	5.573	0.001***
Panel B: $H_0 : \Delta GDP \nrightarrow \Delta RCR$								
Country	K	SR Granger noncausality test ($H_0 : \text{all } \varphi_{2i} = 0$)		LR weak exogeneity test ($H_0 : \theta_2 = 0$)			SR + LR strong exogeneity test ($H_0 : \text{all } \varphi_{2i} = \theta_2 = 0$)	
		F stat	p values	ECT_{t-1}	t stat	p values	F stat^a	p values^a
Indonesia	5	1.201	0.335	-0.078	1.405	0.171	1.046	0.418
Turkey	5	1.079	0.395	-0.056	1.823	0.080*	1.083	0.399
Iran	6	2.405	0.055*	-0.152	1.058	0.299	2.099	0.079*
Singapore	3	1.511	0.231	-0.004	0.860	0.396	1.542	0.215
Jordan	4	1.044	0.390	-0.055	-0.946	0.347	1.117	0.359
Malaysia	5	2.031	0.143	-0.083	1.281	0.206	1.357	0.267
Tunisia	3	0.658	0.582	-0.008	-2.269	0.028**	1.818	0.144

Note. *K* is number of lags in ECM. In Panel A, *F* stat^a is of the Wald statistics test for the significance of the null hypothesis $H_0 : \text{all } \varphi_{1i} = 0$, *F* stat^b is of the Wald statistics test for the significance of the null hypothesis $H_0 : \text{all } \varphi_{1i} = \theta_1 = 0$, and *t* stat^a is of the Wald statistics test for the significance of the null hypothesis $H_0 : \theta_1 = 0$. Panels A and B are estimated using Equations (3) and (4), respectively. SR is short run and LR is long run.

*Statistical significance at the 10% level. **Statistical significance at the 5% level. ***Statistical significance at the 1% level.

Granger causality is found in Costa Rica, Ecuador, and Guatemala.

As for the long-run weak exogeneity tests, the null hypothesis of noncausality from real credit to the private sector to real GDP is not rejected in Peru and Guatemala at any level. The error correction term has a negative sign in all countries except Argentina. On the other hand, long-run causality from real GDP to real credit to the private sector is found in all countries without Islamic banks except for Chile (see Table 4, Panel B). Finally, the strong exogeneity tests suggest bidirectional causality in all countries except Argentina, Chile, and Peru (see Table 4).

There is evidence of short-run unidirectional causality from real credit to the private sector to real GDP in all countries with Islamic banks except for Singapore and Malaysia and short-run bidirectional causality only in Iran at the 10% level (see Table 5, Panel A). The weak exogeneity tests indicate that both variables are weakly exogenous at the 5% level in all countries with Islamic. The strong exogeneity tests imply unidirectional causality

except for Iran. Long-run causality from real GDP to real credit is found only in two countries, namely, Tunisia at the 5% level and Turkey at the 10% level. It is noteworthy that in the long run, real GDP causes real credit to the private sector in the countries without Islamic banks, whereas causality runs in the opposite direction in the countries with Islamic banks. In brief, our results provide strong evidence of long-run causality running from real credit to real GDP and weak evidence of bidirectional short-run causality in countries with Islamic banks. In contrast, for the countries without Islamic banks, there is strong evidence of long-run causality running from real GDP to real credit.

These findings can be explained in terms of the principles of Islamic finance. As previously mentioned, Islamic banks spur economic growth by providing credit for productive investment (Gulzar & Masih, 2015; Kammer et al., 2015), their financial transactions being linked to real assets (Askari, 2012; Siddiqi, 2006). Moreover, they provide credit to households and firms not

normally dealing with the financial system for religious reasons. Further, Islamic banks are more likely to provide funds to small and medium-sized enterprises, which results in higher financial inclusion and possibly higher economic growth (Ebrahim et al., 2017; Imam & Kpodar, 2016). Our findings are in line with those of Kassim (2016) and Imam and Kpodar (2016), who reported that Islamic banks have a measurable impact on economic growth. Although Choudhury (1999) found no evidence that Islamic banking stimulates output growth in a sample of countries including Turkey, his results might simply reflect the lack of Shariah law-complaint financial products (see Johnson, 2013). Further, Goaid and Sassi (2010) found that Islamic banks do not contribute to economic growth in the oil producing countries (which are excluded from our sample) and this might be explained

by the problem facing those countries, known as “the crux of the Dutch disease.”¹¹ Our findings in countries with Islamic banks support the supply-leading theory according to which financial institutions increase the supply of credit and therefore GDP (Beck et al., 2014; King & Levine, 1993).

As for the countries without Islamic banks, our findings do not support the idea that credit or financial development has a crucial role in stimulating economic growth (see King & Levine, 1993; Levine & Zervos, 1998, among others). This could be because the effects of credit and financial services depend on the allocation of loans to productive investment projects (see Ang & McKibbin, 2007). A weak effect could reflect an increase in credit in conjunction with a lack of monitoring from banks (see Gavin & Hausmann, 1996).

TABLE 6 Results of the panel causality tests

Panel A: $H_0 : \Delta Cr \nrightarrow \Delta GDP$						
<i>K</i>	SR Granger noncausality test ($H_0 : \text{all } \varphi_{1,i,k} = 0$)		LR weak exogeneity test ($H_0 : \theta_{1,i} = 0$)		SR + LR strong exogeneity ($H_0 : \text{all } \varphi_{1,i,k} = \theta_{1,i} = 0$)	
	<i>F</i> statistic	<i>p</i> values	<i>t</i> statistic	<i>p</i> values	<i>F</i> statistic ^a	<i>p</i> values
Panel A1. Countries without Islamic banks						
8	8.104	0.000***	1.551	0.122	8.766	0.000***
Panel A2. Countries with Islamic banks						
9	1.532	0.136	−2.555	0.011**	2.386	0.009***
Panel A2. All countries						
7	3.83	0.009***	−0.631	0.527	3.433	0.004***
Panel B: $H_0 : \Delta GDP \nrightarrow \Delta Cr$						
<i>K</i>	SR Granger noncausality test ($H_0 : \text{all } \beta_{2,i,k} = 0$)		LR weak exogeneity test ($H_0 : \theta_{2,i} = 0$)		SR + LR strong exogeneity test ($H_0 : \text{all } \beta_{2,i,k} = \theta_{2,i} = 0$)	
	<i>F</i> statistic	<i>p</i> values	<i>t</i> statistic	<i>p</i> values	<i>F</i> statistic ^a	<i>p</i> values ^a
Panel B1. Countries without Islamic banks						
8	7.357	0.025**	−2.313	0.021**	18.112	0.000***
Panel B2. Countries with Islamic banks						
9	1.193	0.298	−1.696	0.090*	1.394	0.175
Panel B3. All countries						
7	2.627	0.011**	−1.984	0.047**	3.242	0.001***

Note. *K* is number of lags in error correction model. The total panel observations are 499, 402, and 901 for countries without Islamic banks, with Islamic banks, and all countries, respectively. *F* statistic is of the Wald statistics test for the significance of the null hypothesis $H_0 : \text{all } \varphi_{1,i,k} = 0$, *F* statistic^a is of the Wald statistics test for the significance of the null hypothesis $H_0 : \text{all } \varphi_{1,i,k} = \theta_{1,i} = 0$, and *t* statistic is of the Wald statistics test for the significance of the null hypothesis $H_0 : \theta_{1,i} = 0$. Panels A and B are estimated using Equations (5) and (6), respectively. SR is short sun and LR is long run.

$$\Delta RGDP_{it} = \alpha_{1i} + \sum_{k=1}^m \beta_{1,i,k} \Delta RGDP_{i,t-k} + \sum_{k=1}^m \varphi_{1,i,k} \Delta RCR_{i,t-k} + \sum_{k=1}^m \delta_{1,i,k} \Delta EX_{i,t-k} + \sum_{k=1}^m \gamma_{1i} \Delta INF_{i,t-k} + \sum_{k=1}^m \delta_{1,i,k} \Delta I_{i,t-k} + \theta_{1,i,k} ECT_{i,t-1} + \epsilon_{1,i,t}, \quad (5)$$

$$\Delta RCR_{it} = \alpha_{2i} + \sum_{k=1}^m \varphi_{2,i,k} \Delta RCR_{i,t-k} + \sum_{k=1}^m \beta_{2,i,k} \Delta RGDP_{i,t-k} + \sum_{k=2}^m \delta_{1,i,k} \Delta EX_{i,t-k} + \sum_{k=2}^m \gamma_{1i} \Delta INF_{i,t-k} + \sum_{k=1}^m \delta_{2,i,k} \Delta I_{i,t-k} + \theta_{2i} ECT_{i,t-1} + \epsilon_{2,i,t}. \quad (6)$$

*Statistical significance at the 10% level. **Statistical significance at the 5% level. ***Statistical significance at the 1% level.

The panel causality test results are shown in Table 6. As already mentioned, the lag length is selected according to the Schwarz Bayesian criterion subject to the removal of the serial correlation in the error term. In the countries with Islamic banks, long-run causality from real credit to real GDP is found at the 5% level while the F statistic fails to reject the null hypothesis of no causality in the short run (see Table 6, Panel A2). By contrast, short-run causality from real credit to GDP is found for countries without Islamic banks (see Table 6, Panel A1). There is evidence of long-run causality from real GDP to real credit in countries without Islamic banks (there is also some weaker evidence, at the 10% level, in countries with Islamic banks), but no evidence of short-run causality in countries with Islamic banks (see Table 6, Panel B). The diagnostic tests (not reported) suggest data congruence.

Further, to check the stability of our models, we run both the cumulative sum and the cumulative sum of squares with recursive residuals following Pesaran and Pesaran (1997). Both tests show that the values of the coefficients stay within the boundaries of the 5% significance level, so the null hypothesis of stable coefficients is accepted for both the short-run and long-run parameters in our ECM models (see Brown, Durbin, & Evans, 1975; Samargandi, Fidrmuc, & Ghosh, 2014; see Figures B1, B2, B3, B4 for a sample of the results; full results are available on request).

On the whole, the long-run results obtained from the two approaches are rather similar: Both suggest that real GDP causes real credit in the countries without Islamic banks except for Chile, whereas there is causality in the opposite direction in the countries with Islamic banks. Bidirectional short-run causality is found in two countries without Islamic banks (Ecuador Costa Rica and Guatemala, at the 1% level) and one with Islamic banks (Iran, at the 5% level). However, there are differences between the two sets of short-run results: The panel tests suggest that short-run causality runs from real credit to real GDP in countries without Islamic banks (and that there is bidirectional causality in one of them, i.e., Iran). Compared with the time series results, the individual countries reveal different causal relationship across the two samples. Time series approaches raise various issues related to the sample size and the power of unit root tests (Christopoulos & Tsionas, 2004), which we have addressed by performing panel tests as well (Persyn & Westerlund, 2008).

6 | CONCLUSIONS

This paper has examined the relationship between real credit to the private sector and real GDP in two sets of emerging countries, with and without Islamic banks,

with the aim of shedding light on the effects of Islamic banking on economic growth. Our extensive cointegration and causality analysis provide strong evidence of long-run causality running from real credit to real GDP and weak evidence of short-run causality in both directions in the countries with Islamic banks. In contrast, long-run causality appears to run in the opposite direction, that is, from real GDP to real credit, in the countries without Islamic banks. These differences between the two sets of countries can be plausibly attributed to the distinctive features of Islamic banks, which provide loans to projects that are directly linked to real economic activities and are not allowed to engage in speculative transactions, in this way improving the allocation of resources in the economy and boosting long-run economic growth.

Therefore, one could argue that policymakers aiming to stimulate growth should regulate commercial banks to increase the proportion of credit to productive investment and impose limits on engaging in speculative transactions; this is clearly an important issue, given the current debate on the causes of the global financial crisis, and the mounting evidence that excessive credit growth to finance speculative, unproductive activities was one of its main causes (see Bernanke, 2009; Turner, 2009). In addition, they should favour a bigger market share for Islamic banks in the countries where they are present.

Future research should also consider possible non-linearities in the relationship between credit and growth and examine the robustness of the results by using other measures of credit such as total credit, the credit-to-GDP gap, and credit to nonfinancial sector (see Drehmann et al., 2011; Drehmann & Tsatsaronis, 2014).¹²

ENDNOTES

¹ Hadith stands for the actions and quotations of the Prophet Mohammad, which are one of the main sources of Islamic guidance in many aspects of Muslim life including economic activities.

² For more details, see Appendix A.

³ "Claims on private sector include gross credit from the financial system to individuals, enterprises, nonfinancial public entities not included under net domestic credit, and financial institutions not included elsewhere" (IMF-IFS line 32d).

⁴ Note that the panel approach follows the same estimation process.

⁵ For further details on panel unit root tests, see Harris and Sollis (2003), Banerjee (1999), Christopoulos and Tsionas (2004), and Breitung and Pesaran (2008), among others.

⁶ These tests are not reported but are available upon request.

⁷ The Engle–Granger cointegration test results suggest the existence of a cointegration relationship between credit and GDP only in Ecuador and Iran (these results are available upon request). However, it is well known that the Engle–Granger cointegration tests have low power in the case of a relatively short sample such as ours (see Banerjee, Dolado, Hendry, & Smith, 1986; Demetriades & Hussein, 1996; Kremers, Ericsson, & Dolado, 1992).

⁸ These tests are not reported but are available upon request.

⁹ For a more detailed discussion about including a dummy variable when testing for cointegration, see Juselius and MacDonald (2004).

¹⁰ The ECT confirms the existence of a long-run relationship between the two variables in our models. Further, the large deviations from the long run seem to be caused by the 1997 Asian crisis and the 2007 recent financial crisis in most countries in our sample (see Figures C1, C2, C3, C4).

¹¹ The Dutch disease is defined as the negative impact on an economy of any factors that increase the inflow of foreign currency, such as oil reserves (see Apergis, El-Montasser, Sekyere, Ajmi, & Gupta, 2014).

¹² Note, however, that the new data set constructed by the BIS (total credit to the nonfinancial sector) is only available for 40 advanced and emerging economies.

ORCID

Guglielmo Maria Caporale  <http://orcid.org/0000-0002-0144-4135>

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APPENDIX A

ISLAMIC FINANCIAL MODELS

Islamic financial models	Explanation
Musharaka (partnership)	It is built on the idea of equity participation. Under Musharaka contract, each participant pays a percentage of the capital in the company. The profits or losses generated from the business will be shared between the owners based on an agreed profits and losses share called PLS (Ariff, 1988).
Mudharabah (profit sharing)	Mudharabah is a contract between two parties: One party supplies the capital of the company, whereas the other party will be considered as an entrepreneur. Therefore, the Islamic bank becomes a shareholder on the bases that any profit or loss occurring from the business is shared between the two parties on a per-determined profit sharing percentage (Haron, Ahmad, & Planisek, 1994).
Murabahah (cost plus)	It is a financial contract for buying and selling a particular product. A Murabahah contract should specify the price, the cost of the item, and the profit margin at the time of signing the contract. The role of the bank in a Murabahah financial instrument is to finance purchasing the good by buying it on the behalf of the customer. The bank will resell it to the customer after adding a markup to the cost price (Ariff, 1988; Haron et al., 1994).
Ijarah (leasing)	The Ijarah refers to an agreement between the lessor and the client to rent for example machinery, vehicles, a shop, or any other equipment. An Islamic bank using an Ijarah financial instrument will buy the machinery or any other equipment and lease it to its customers for an agreed rent. If the customer requires the bank to buy the equipment as well, the rent and a monthly instalment as a part of the purchase will be incurred (Zaher & Kabir Hassan, 2001).

APPENDIX B

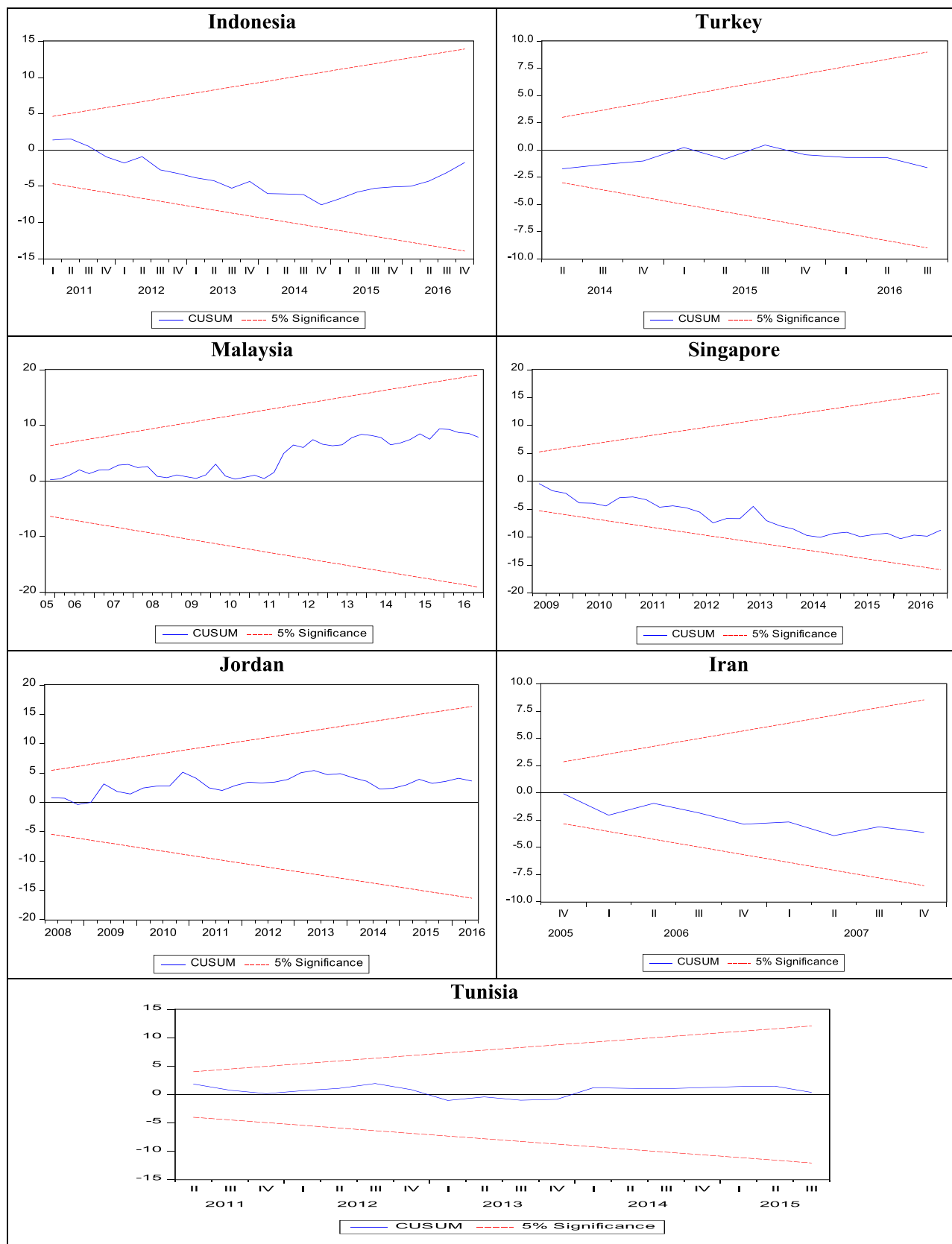


FIGURE B1 Plot of cumulative sum (CUSUM) test for coefficient stability of error correction model—countries with Islamic banks [Colour figure can be viewed at wileyonlinelibrary.com]

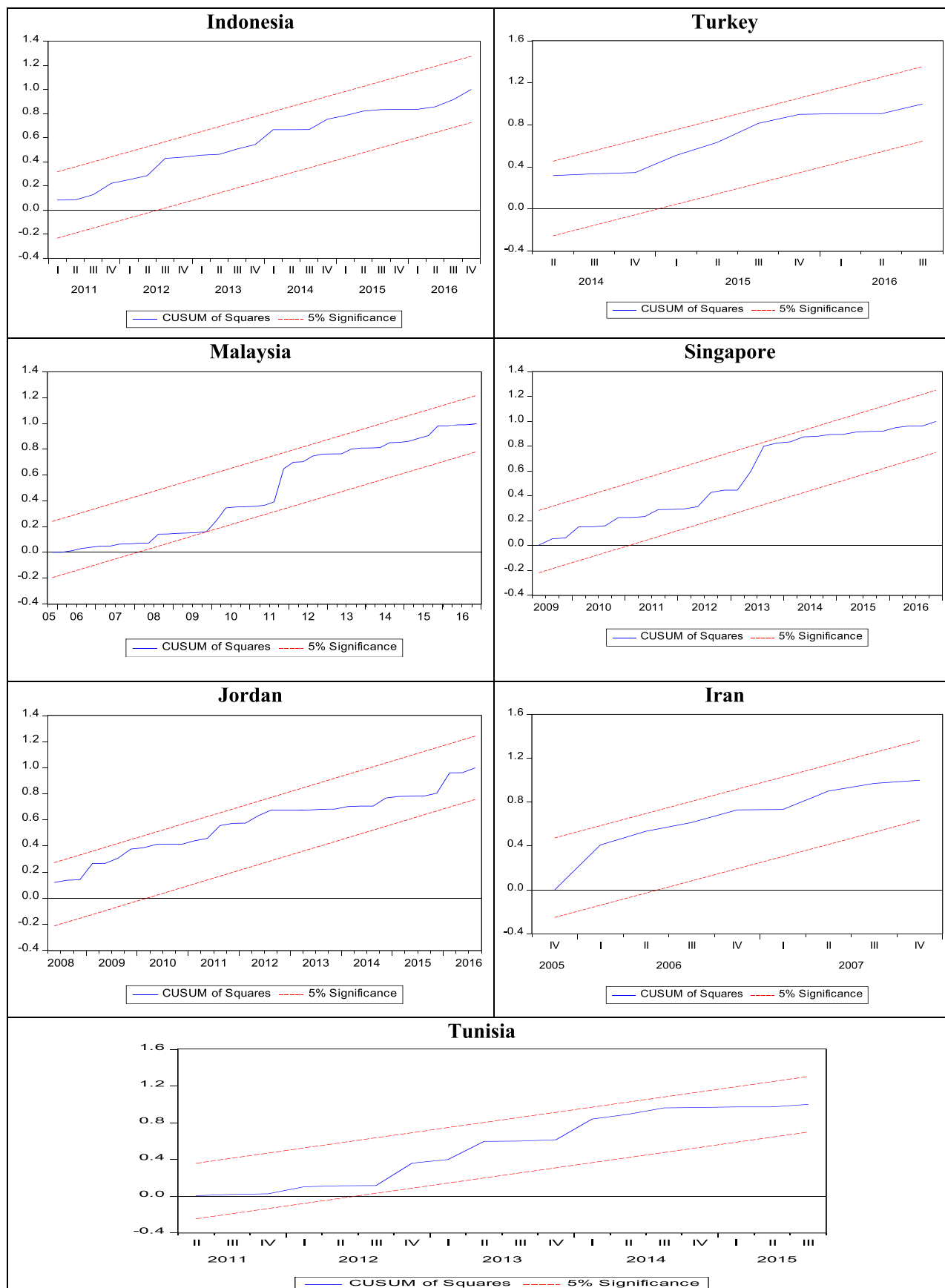


FIGURE B2 Plot of cumulative sum (CUSUM) of squares test for coefficient stability of error correction model—Countries with Islamic banks [Colour figure can be viewed at wileyonlinelibrary.com]

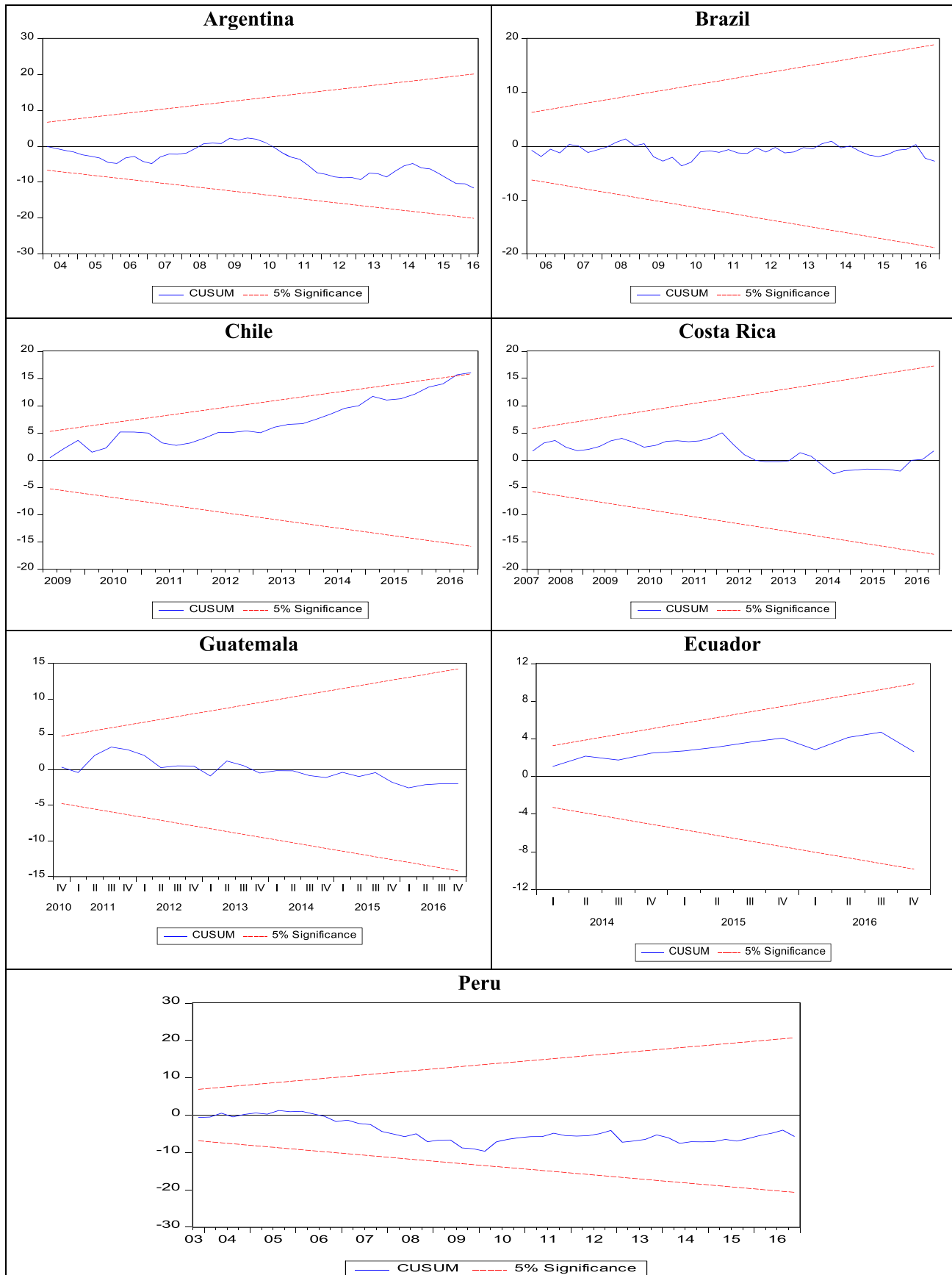


FIGURE B3 Plot of cumulative sum (CUSUM) test for coefficient stability of error correction model—Countries without Islamic banks [Colour figure can be viewed at wileyonlinelibrary.com]

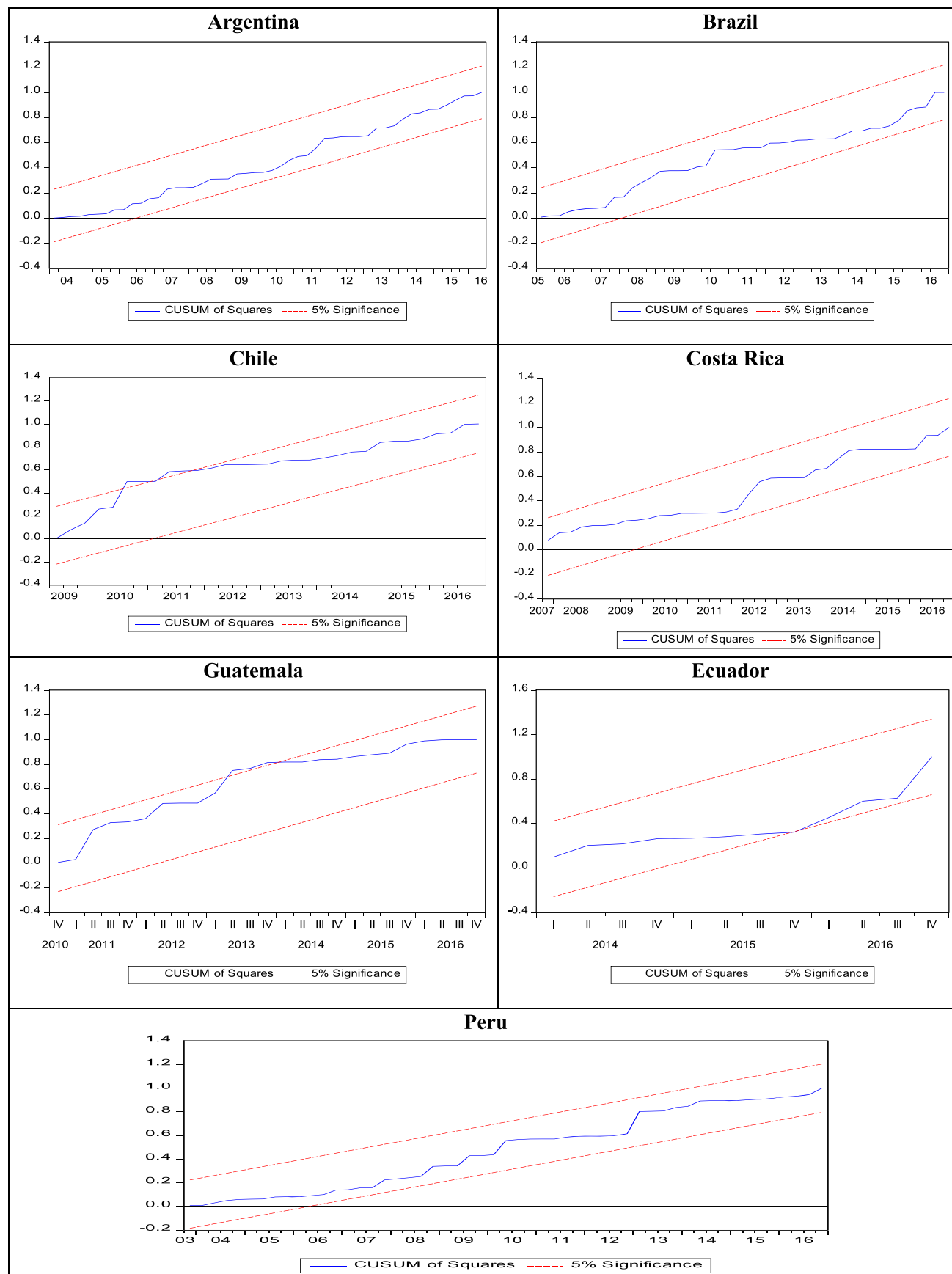


FIGURE B4 Plot of cumulative sum (CUSUM) test for coefficient stability of error correction model—Countries without Islamic banks [Colour figure can be viewed at wileyonlinelibrary.com]

APPENDIX C

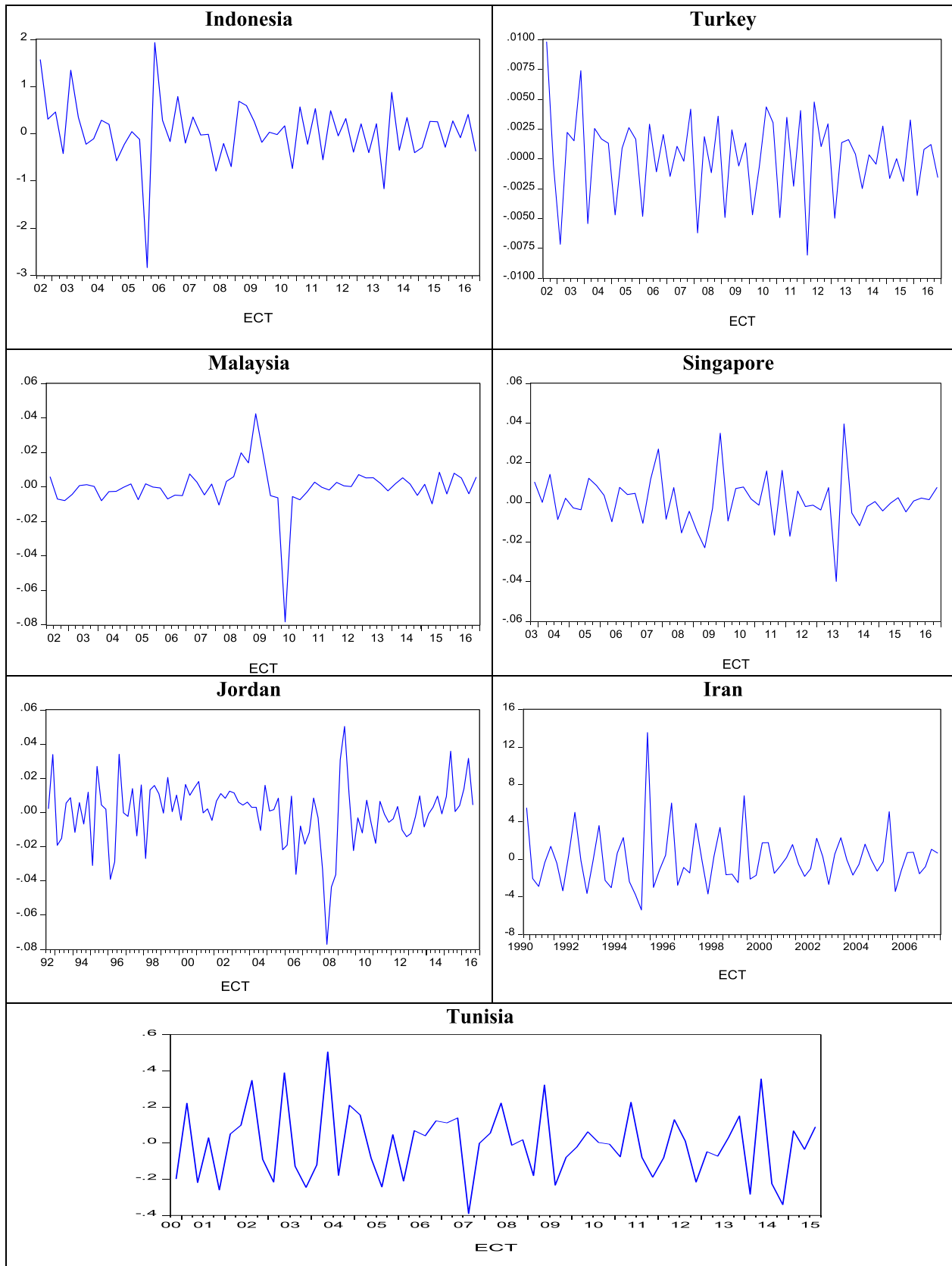


FIGURE C1 Plot of the error correction term (ECT) for countries with Islamic banks (Cr-GDP) [Colour figure can be viewed at wileyonlinelibrary.com]

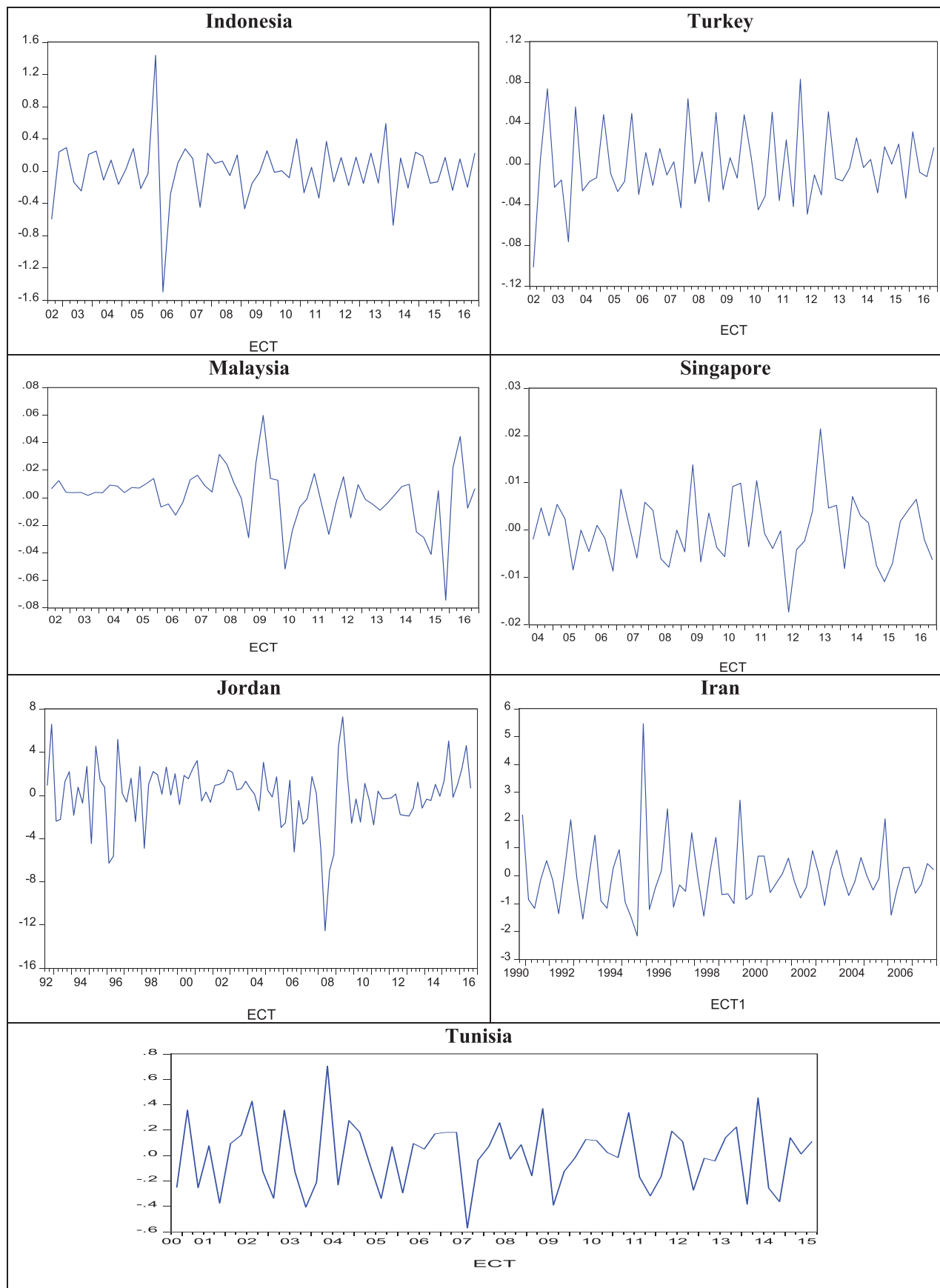


FIGURE C2 Plot of the error correction term (ECT) for countries with Islamic banks (GDP-Cr) [Colour figure can be viewed at wileyonlinelibrary.com]

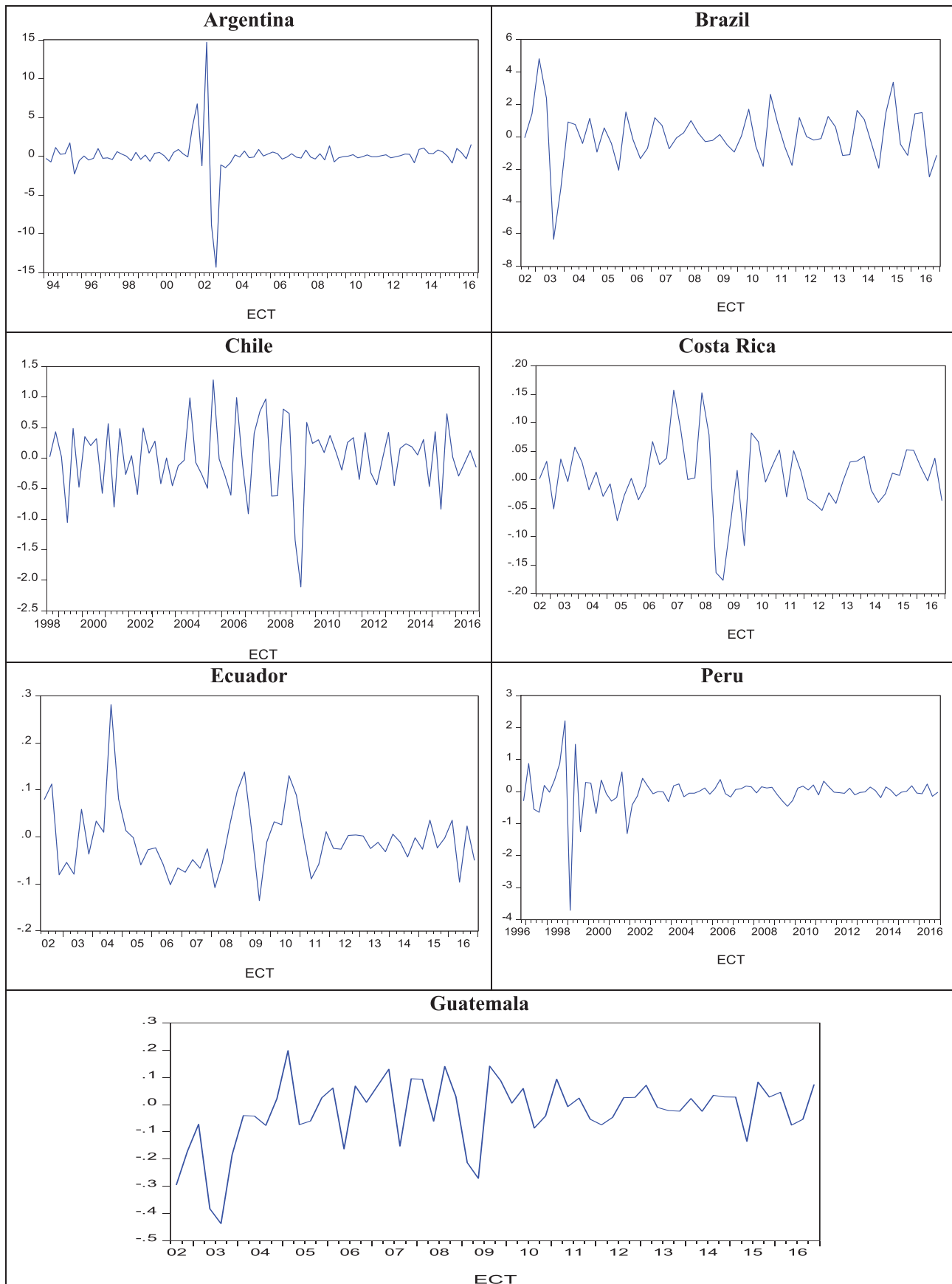


FIGURE C3 Plot of the error correction term (ECT) for countries without Islamic banks (Cr-GDP) [Colour figure can be viewed at wileyonlinelibrary.com]

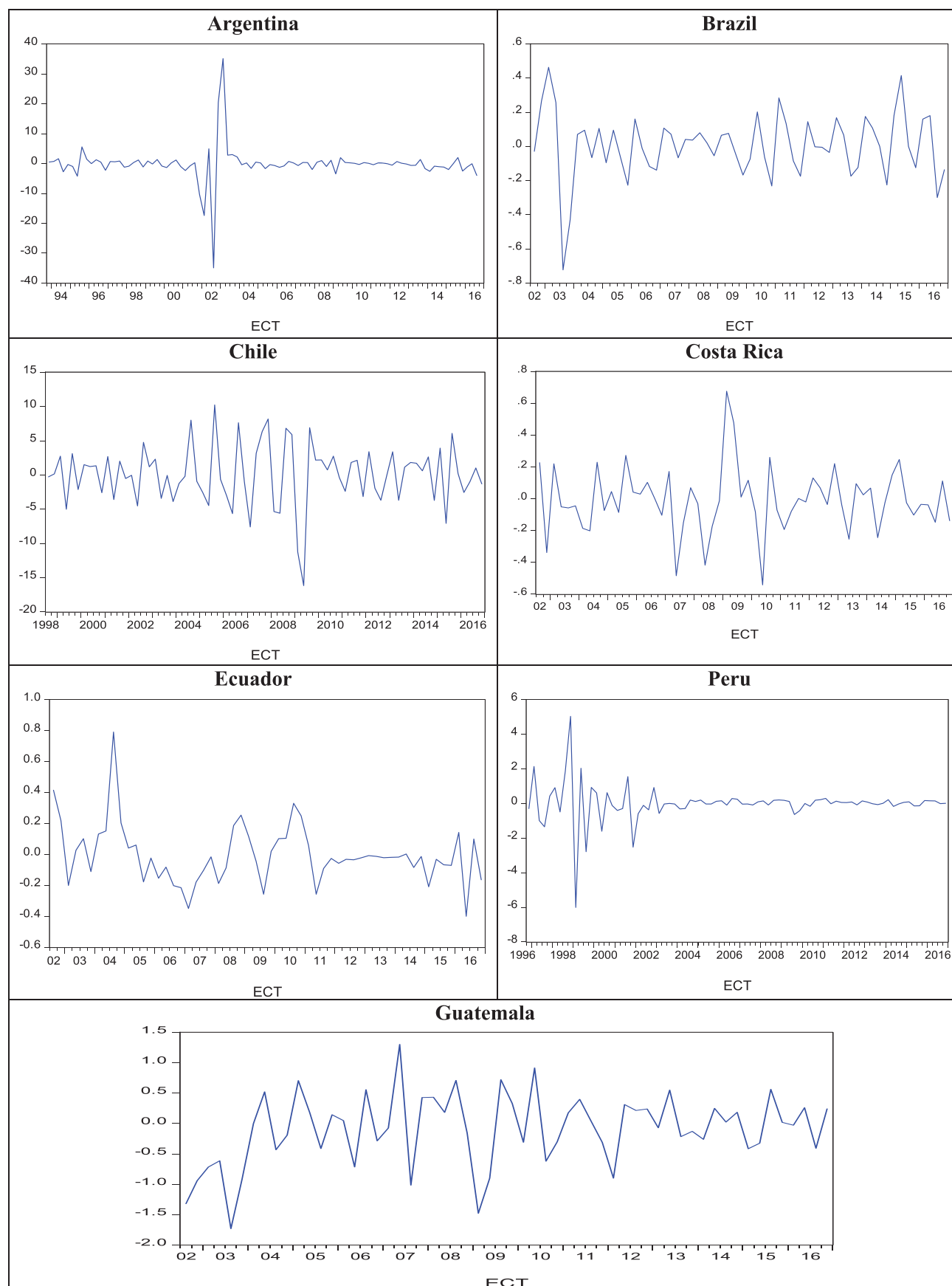


FIGURE C4 Plot of the error correction term (ECT) for countries without Islamic banks (GDP-Cr) [Colour figure can be viewed at wileyonlinelibrary.com]